Screening for Thyroid Dysfunction in a Community Population of Diabetic Patients

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In a general practice population of 11 300 patients, 223 were known to have diabetes mellitus. Thirteen diabetic patients (5.8 %) had a previous diagnosis of thyroid disease. The study excluded 17 patients who received sole diabetes care at a secondary referral centre (of whom 5 had a previous diagnosis of thyroid disease), 8 with a previous diagnosis of thyroid disease receiving community care, and 1 patient who declined screening. New thyroid disease was diagnosed in 11 patients (8 female, 3 male): 5 with primary hypothyroidism, 4 with subclinical hypothyroidism, 1 with hyperthyroidism and 1 with subclinical hyperthyroidism. Thus the prevalence of undiagnosed thyroid disease in diabetic patients receiving community diabetes care was 5.5 % (9.5 % of female patients), and the prevalence of thyroid disease (previously known and diagnosed as a result of screening) in the entire population of diabetic patients registered in the general practice was 10.8 %. These findings suggest that screening for thyroid disease should be considered in patients receiving diabetes care in the community.

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Introduction

Thyroid disease is relatively common in an adult population, although mass screening is unjustified because of a low yield and a significant rate of false positive results, secondary to drugs or non-thyroidal illness.[1–3] Diabetic patients attending hospital-based clinics, especially those with Type 1 diabetes mellitus, have a higher prevalence of thyroid disease than the general population,[4–6] and the detection rate by annual screening for thyroid disease may be as high as 13.4 %.[4] Compared to diabetes care in the community, secondary referral centres deliver diabetes care to a selected population typically including a higher proportion of Type 1 diabetes and patients with advanced microvascular and other complications. This bias may contribute to the high prevalence of thyroid disease in diabetic patients reported previously.[4–6] The value of screening patients with diabetes for thyroid disease in the community is unknown, although a recent survey in Northumberland (UK) revealed that 24 % of general practices performed annual thyroid function tests (unpublished).

The aim of this study was to determine the prevalence of thyroid disease in diabetic patients receiving diabetes care in the community.

Patients and Methods

Patients

Diabetic patients registered at a general practice serving a semi-rural Caucasian population, were identified. Of 11 300 patients, 223 (2 %) had diabetes. Prior to the initiation of the study the practice operated no screening policy for thyroid disease in diabetic patients, and thyroid function tests were requested by general practitioners only if thyroid disease was suspected clinically. Patients excluded from the study were those with previously diagnosed thyroid disease ($n = 13$) (in community care ($n = 8$) or at a secondary referral centre ($n = 5$)); those without a previous thyroid disease diagnosis who were receiving sole hospital-based diabetes care ($n = 12$); and one patient who failed to attend for screening. Thyroid function was assessed in the remaining 197 diabetic patients at their annual review appointment. The study group comprised 114 male and 84 female patients, with a mean age of 64.7 ± 14.5 (17–93) years. They included 14 Type 1, 18 insulin-treated Type 2 and 166 Type 2 diabetic patients (114 treated with oral hypoglycaemic agents and 52 with diet only). Seventy-four per cent of patients had satisfactory glycaemic control (HbA_{1c} concentration of less than 7.6 %).[7]

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Methods

Venous blood was withdrawn at the annual review clinic attendance for routine testing and the additional test for thyroid function was requested. Clinical data were reviewed from the computerized database and the patients' general practice records.

Free thyroxine (FT4) and thyroid stimulating hormone (TSH) were measured by using the CIBA/CORNING assay. Assays were performed in the Department of Clinical Biochemistry, Wansbeck Hospital, Ashington, UK. During the course of the study the reference ranges underwent a slight adjustment (FT4 10.3–19.4 nmol l^{-1} and 10-25 nmol l^{-1}, TSH 0.35–5.50 mU l^{-1} and 0.17–2.87 mU l^{-1}), therefore the results of thyroid function tests were classified as follows:

normal when both FT4 and TSH were in the normal range;
hypothyroidism when FT4 was less, and TSH greater than the reference ranges;
hyperthyroidism when FT4 was greater, and TSH less, than the reference ranges;
subclinical hypothyroidism when FT4 was within the normal range and TSH greater than the reference ranges;
subclinical hyperthyroidism when FT4 was within the normal range and TSH less than the reference ranges.

Patients with abnormal thyroid function tests were recalled for clinical assessment by the general practitioner, and treatment initiated if clinically indicated.

During the study two different assay methods were used for measuring the glycated haemoglobin (HbA_{1c}): the earlier method used the Novoclone Enzyme Immunoassay where acceptable control was defined as <5.2, the later method used high performance liquid chromatography on a Bio-Rad Diamat or Variant system, where acceptable control was defined as <7.6.

Results

One hundred and ninety-eight patients were identified who were attending the general practice diabetic clinic and had no previously known thyroid disease. One patient defaulted, leaving 197 patients who had a thyroid function test included at their annual diabetic review. A diagnosis of thyroid disease was made in 11 patients, yielding a prevalence of 5.6 % in a population of diabetic patients attending a community diabetic clinic (Table 1). The mean age of diabetic patients with thyroid disease was 62 ± 15.4 (33–84) years and they included 8 female and 3 male patients. Primary hypothyroidism was diagnosed in 5 patients (2.5 %), subclinical hypothyroidism in 4 patients (2 %), hyperthyroidism in 1 patient (0.5 %), and subclinical hyperthyroidism in 1 patient (0.5 %). One hypothyroid patient had Type 1 diabetes. The remaining patients with thyroid disease had Type 2 diabetes (1 treated with insulin, 5 with oral hypoglycaemic agents and 4 with diet alone) (Table 2). Thyroid disease was more common in female (9.5 %) than in male diabetic patients (2.6 %).

The detection of abnormal thyroid function tests prompted general practitioners to treat all hypothyroid and 3 of the 4 subclinically hypothyroid patients with thyroxine. One patient with subclinical hypothyroidism was untreated and subsequent testing of thyroid status revealed normal results. One hyperthyroid patient died from cardiovascular disease shortly after screening and before receiving further assessment or treatment. One patient with subclinical hyperthyroidism had normal T3 concentration and no further action was taken.

When the number of previously known patients with thyroid disease was added to the number of newly diagnosed patients, the prevalence of thyroid disease in diabetic patients was 10.8 %.

Discussion

In this small study, the prevalence of thyroid disease in diabetic patients in the community (10.8 %) was greater than that reported in the general population (6.6 %)[2] but lower than that found in a hospital diabetic clinic (13.4 %).[4] This may be due to the lower proportion of Type 1 diabetic patients and a higher ratio of male to female patients in the population studied. Community-based biochemical screening for thyroid disease may be justified in diabetic patients in view of the high yield demonstrated in this study, and the likelihood of symptoms of thyroid disease being masked by the diabetic state. The potential benefits of treating thyroid dysfunction identified as a result of screening include improvement of the lipid profile,[8] prevention of atrial fibrillation, and osteoporosis,[10] and improvement of glycaemic control. Given the high morbidity and mortality of diabetic patients from macrovascular disease, it can be argued that screening for thyroid disease would be of more value in diabetic patients than in the general population. Many cases detected by screening belonged to the 'subclinical hypothyroidism' category. Justification of life-long thyroxine therapy for subclinical hypothyroidism is controversial,[11] but the rate of progression to overt hypothyroidism is high and requires follow-up if not treatment.[12] Potential disadvantages of screening include an increased workload and the financial burden of the tests. Furthermore, detection of abnormal thyroid function tests should be followed by detailed clinical assessment for an accurate diagnosis, in order to avoid mismanagement of conditions such as thyroid dysfunction due to non-thyroidal illness, transient hyper- and hypothyroidism due to thyroiditis, and the rare presentation of hypopituitarism or Addison's disease masquerading as biochemical hypothyroidism.

In conclusion, this study has demonstrated a high prevalence of thyroid disease in diabetic patients attending a community-based diabetic clinic. Screening for thyroid disease in diabetic patients in this setting may be justified, but requires implementation of a

Table 1. Characteristics of the 11 patients diagnosed with thyroid disease

Number	Age	Sex	Type of diabetes	FT4	FT4 ref. range	TSH	TSH ref. range	HbA_{1c}	Ref. range	Treatment
Subclinical hypothyroid										
1	48	F	2 (oral)	10.4	10.3–19.4	5.96	0.35–5.5	5.1	<5.2	Thyroxine
2	82	F	2 (oral)	10.5	10.3–19.4	12.79	0.35–5.5	6.7	<7.6	Thyroxine
3	56	M	2 (diet only)	13.5	10.3–19.4	5.9	0.35–5.5	6.5	<7.6	None
4	76	M	2 (diet only)	13	10.3–19.4	20.4	0.35–5.5	5	<5.2	Thyroxine
Hypothyroid										
5	63	F	2 (insulin)	9.5	10–25	3.11	0.17–2.87	6.2	<5.2	Thyroxine
6	48	F	2 (oral)	8.9	10–25	8.05	0.17–2.87	5.1	<5.2	Thyroxine
7	59	F	2 (oral)	6.6	10.3–19.4	49.06	0.35–5.5	6.3	<7.6	Thyroxine
8	74	F	2 (oral)	10.1	10.3–19.4	9.1	0.35–5.5	5.1	<5.2	Thyroxine
9	31	F	1 (insulin)	8	10.3–19.4	18.36	0.35–5.5	10.3	<7.6	Thyroxine
Subclinical hyperthyroid										
10	74	F	2 (oral)	15.1	10.3–19.4	0.06	0.35–5.5	7.1	<7.6	T3 normal
Hyperthyroid										
11	71	M	2 (oral)	23.2	10.3–19.4	0.1	0.35–5.5	8.2	<7.6	Deceased

FT4, free thyroxine; TSH, thyroid stimulating hormone.

Table 2. Incidence of newly diagnosed thyroid disease in general practice diabetic patients

	Hypo-thyroid	Hyper-thyroid	Subclinical hypo	Subclinical hyper
All cases (*n*)	5	1	4	1
Type 1 female	1			
Type 2 female	4		2	1
Type 2 male (no Type 1 males)		1	2	

comprehensive protocol and access to a specialist thyroid service to ensure optimal management.

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References

1. Vanderpump MPJ, Ahlquist JAO, Franklyn JA, Clayton RN, *et al*. Consensus statement for good practice and audit measures in the management of hypothyroidism and hyperthyroidism. *Br Med J* 1996; **313**: 539–544.
2. Tunbridge WMG, Evered DC, Hall R, Appleton D, Brewis M, Clark F, *et al*. The spectrum of thyroid disease in the community: the Whickham survey. *Clin Endocrinol* 1977; **7**: 481–493.
3. Rae P, Farrar J, Beckett G, Toft A. Assessment of thyroid status in elderly people. *Br Med J* 1993; **307**: 177–190.
4. Perros P, McCrimmon RJ, Shaw G, Frier BM. Frequency of thyroid dysfunction in diabetic patients: value of annual screening. *Diabetic Med* 1995; **12**: 622–627.
5. Feely J, Isles TE. Screening for thyroid dysfunction in diabetics. *Br Med J* 1979; **1**: 1678.
6. Gray RS, Irvine WJ, Toft AD, Clarke BF, Seth J, Cameron EHD. Unrecognised thyroid failure in diabetes mellitus. *J Clin Lab Immunol* 1979; **2**: 221–224.
7. Smithson J. Diabetes audit from 1987–1993 carried out in a general practice clinic. *Practical Diabetes* 1995; **12**: 14–15.
8. Tanis BC, Westendorp GJ, Smelt AHM. Effects of thyroid substitution on hypercholesterolaemia in patients with subclinical hypothyroidism: a reanalysis of intervention studies. *Clin Endocrinol* 1996; **44**: 643–649.
9. Forfar JC, Toft AD. Thyrotoxic atrial fibrillation: an underdiagnosed condition? *Br Med J* 1982; **285**: 909–910.
10. Frazer SA, Smith DA, Andersen JB, Wilson GM. Osteoporosis secondary to thyroid disorders. *Lancet* 1071; **1**: 981–983.
11. Toft AD. Thyroxine replacement therapy. *Ann Acad Med* 1993; **22**: 583–586.
12. Vanderpump MPJ, Tunbridge WMG, French JM, Appleton D, Bates D, Clark F, *et al*. The incidence of thyroid disorders in the community: a twenty-year follow-up of the Whickham Survey. *Clin Endocrinol* 1995; **43**: 55–68.